Defense Environmental Restoration Program

Record of Decision Final

Umatilla Depot Activity Inactive Landfills Operable Unit

Revision 1
March 1993

Signed 8-17-93

In accordance with Army Regulation 200-2, this document is intended by the Army to comply with the National Environmental Policy Act (NEPA) of 1969.

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Acronyms and Abbreviations

ADA	Amunition Demolition Activity
ARARs	Applicable or Relevant and Appropriate Requirements
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CPF	Cancer Potency Factor
DoD	Department of Defense
2,4-DNT	2,4-Dinitrotoluene
2,6-DNT	2,6-Dinitrotoluene
EPA	Environmental Protection Agency
FFA	Federal Facilities Agreement
FS	Feasibility Study
ILOU	Inactive Landfill Operable Unit
MSL	Mean Sea Level
NA	Not Applicable
NCP	National Contingency Plan
NIL	Northern Inactive Landfill
NILE	Northern Inactive Landfill Extension
NPL	National Priorities List
ODEQ	Oregon Department of Environmental Quality
OU	Operable Unit
PCBs	Polychlorinated-biphenyls
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine (Royal Demolition Explosive)
RfD	Reference Dose
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SEIL	Southeastern Inactive Landfill
SIL	Southern Inactive Landfill
SILE	Southern Inactive Landfill Extension
TAL	Target Analyte List
TRC	Technical Review Committee
UMDA	U.S. Army Depot Activity at Umatilla
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
WIDS	Western Inactive Drum Site

Section 1

Declaration

Site Name and Location

U.S Army Depot Activity, Umatilla
Inactive Landfills Operable Unit
Hermiston, Oregon 97838-9544

Statement of Basis and Purpose

This Decision Document presents the selected no-action remedial alternative for the Inactive Landfills Operable Unit at the U.S. Army Depot Activity, Umatilla (UMDA) in Hermiston, Oregon (Figure 1). This alternative was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Contingency Plan (NCP), (40 CFR Part 300 et seq. 1992; 55 Federal Register 8666 March 1990), as amended. This decision is based on information contained in the administrative record file for this operable unit.

The remedy was selected by the U.S. Army (Army) and the U.S. Environmental Protection Agency (EPA). The State of Oregon Department of Environmental Quality (ODEQ) was given the opportunity to participate in the review and decision process and concurs with the selection of a no-action remedy for this site.

Description of the Selected Remedy

The Inactive Landfills Operable Unit (ILOU) is one of eight operable units at UMDA. The ILOU includes six discrete former disposal areas totalling an area of approximately 300,000 square feet, (approximately 8 acres) located west of the UMDA administration area. The other operable units are: the Deactivation Furnace Soils; the Active Landfill; the Explosives Washout Lagoons Soils; the Explosives Washout Lagoons Ground Water; the Ammunition Demolition Activity (ADA) Area; the Miscellaneous UMDA Sites; and the Explosives Washout Plant (Building 484). Four of these operable units are at the Record of Decision (ROD) stage, the rest are still in the Remedial Investigation/ Feasibility Study (RI/FS) process. The four operable units at the ROD stage are: Explosives Washout Lagoons Soils, which has a signed final ROD; lead contaminated soil around the Deactivation Furnace; the Active Landfill; and the Inactive Landfills. The ILOU is addressed in this ROD.

The Army, EPA, and ODEQ have selected "No Action" as the remedy for the Inactive Landfills Operable Unit at UMDA, in Hermiston, Oregon. This selection was made based upon information generated during the RI which indicates that the site does not pose an unacceptable threat to human health and/or the environment.

Declaration Statement

Data gathered during the RI of the ILOU, and the results of the evaluation of that data in the human health risk assessment, indicate that the ILOU in its current condition does not pose an unacceptable risk to human health or the environment. The data also indicate that any potential future land use at the site would not result in an unacceptable risk to public health or the environment. A five-year review of the Inactive Landfill Operable Unit is not required because the physical site conditions are not expected to be altered and no site access restrictions, risk-based or otherwise, are needed.

Lead and Support Agency Acceptance
of the Record of Decision,
U.S. Army Depot Activity Umatilla,
Inactive Landfills Operable Unit
December 1992

Signature sheet for the foregoing Record of Decision for the Inactive Landfills Operable Unit final action at the U.S. Army Depot Activity at Umatilla by the U.S. Army and the U.S. Environmental Protection Agency, with the concurrence of the State of Oregon Department of Environmental Quality.

Lewis D. Walker — 3/1/94

Lewis D. Walker
Deputy Assistant Secretary of the Army
(Environment, Safety, and Occupational Health)

Date

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Moses Whitehurst Jr. — 17 August 1993

Lieutenant Colonel Moses Whitehurst Jr. — Date

Commander, U.S. Army Depot Activity, Umatilla

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of the Record of Decision,
U.S. Army Depot Activity Umatilla,
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December 1992

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Gerald A. Emison
Acting Regional Administrator, Region 10
U.S. Environmental Protection Agency

8-10-93
Date

Lead and Support Agency Acceptance
of the Record of Decision,
U.S. Army Depot Activity Umatilla,
Inactive Landfills Operable Unit
December 1992

Signature sheet for the foregoing Record of Decision for the Inactive Landfills Operable Unit final action at the U.S. Army Depot Activity at Umatilla by the U.S. Army and the U.S. Environmental Protection Agency, with concurrence of the State of Oregon Department of Environmental Quality.

Frederic K. Taylor Jr. 1-4-93

Frederic J. Hansen — Date
Director
Oregon Department of Environmental Quality

Note: The State of Oregon's Letter of Concurrence is appended to this Record of Decision.

Section 2

Decision Summary

This Decision Summary provides an overview of the characteristics of the Inactive Landfills Operable Unit (ILOU) at the U.S. Army Depot Activity Umatilla (UMDA), and the environmental assessment activities that have been performed. It then discusses the rationale used to choose the selected remedy.

2.1 Site Name, Location and Description

UMDA is located in Morrow and Umatilla Counties in rural, northeastern Oregon. UMDA is approximately 10 miles west of Hermiston; one to two miles west of the Umatilla River; 175 miles east of Portland; and two miles south of the Columbia River. The town of Hermiston with approximately 10,000 residents is the largest local population center. Irrigon and Umatilla, which border UMDA to the northwest and northeast respectively, are farming communities of less than 1,000 residents each (Figure 1).

Topography across UMDA rises gently to the south with distance from the Columbia River. Elevations range from 410 feet Mean Sea Level (MSL) near the northwest corner, to 660 feet to the southwest. The ILOU is at an average elevation of approximately 600 feet MSL. The most significant geologic feature at UMDA is Coyote Coulee which trends southwest-northeast across the eastern half of UMDA. It is a sedimentary structure, a sand wave, deposited during a historic catastrophic flooding event. The ILOU is located on relatively permeable glaciofluvial sedimentary deposits consisting of fine to coarse sand and gravel with increasing silt at depth. The sand and gravel deposits are underlain by the Columbia River Basalt Group. The area can be characterized as semi-arid, receiving only eight to nine inches of precipitation annually. The relatively low precipitation in conjunction with the high permeability of the geologic material present, result in very minimal surface drainage. There are no streams or surface water bodies at UMDA. Man-made canals built to recharge local ground water are the most prevalent small scale surface water features in the local area.

UMDA was originally established as an Army ordnance depot in 1941 for the purpose of storing and handling munitions. Access is currently restricted to military personnel and authorized contractors. However, the conventional ordnance storage mission at UMDA has been transferred to another installation as part of realignment under the Department of Defense (DoD) Base Realignment and Closure (BRAC) program. Under this program, it is possible that the Army will close the site after the scheduled chemical stockpile demilitarization mission is completed; ownership could then be relinquished to another governmental agency or private interest. Light industry is considered to be the most likely future land use scenario; future residential use is also a possibility.

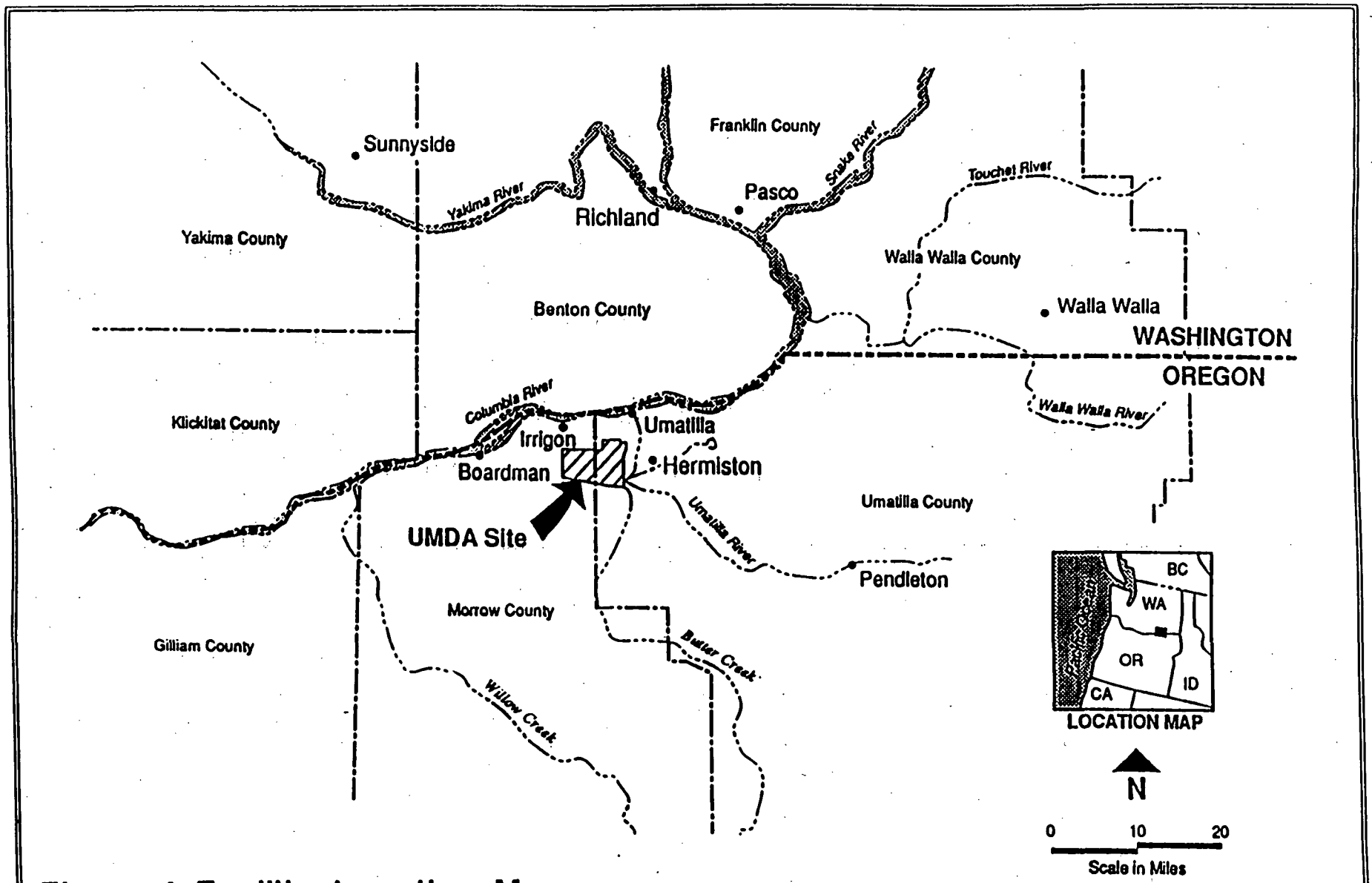

Figure 1 Facility Location Map

PREPARED FOR: UMATILLA			SOURCE: Explosives Washout Lagoons Soils Operable Unit, Umatilla Depot Activity, Record of Decision, Sept. 1992	TITLE: FACILITY LOCATION MAP UMATILLA DEPOT ACTIVITY
DATE: Sept.1992	SCALE: AS SHOWN	DWG. NO. 67062-010		

The land use surrounding UMDA is primarily agricultural. Regional crops include potatoes, alfalfa, corn, wheat, onions, asparagus, apples, grapes, and watermelons. There are also some cattle and hog farms. The influence of the agricultural activities is most prevalent in the southern portions of UMDA where ground water flow direction is observed to vary 180 degrees from its natural northern direction when the irrigation wells are pumping. This effect is observed at the ILOU.

Approximately 1,470 wells have been identified within a four-mile radius of UMDA, the majority of which are used for domestic and irrigation water. Three municipal water systems (Hermiston, Umatilla and Irrigon) draw ground water from within a four-mile radius of UMDA. The Columbia River is a major source of potable and irrigation water and is also used for recreation, fishing and the generation of hydroelectric power. The principal use of the Umatilla River is irrigation.

The ILOU is situated in the south-central portion of UMDA just east of Antelope Road and approximately 2,000 feet west of the Administration Area (Figure 2 and Figure 3). The six former disposal areas cover an area totaling approximately 300,000 square feet. ILOU is bounded to the east by Rim Road South, to the south by railroad tracks and Yard Office Road, to the west by Antelope Road and to the north by South Magazine Road. The operable unit is also bisected by a set of railroad tracks (Figure 3).

The ILOU is made up of six former disposal areas. The six inactive landfills include: the Northern Inactive Landfill (NIL), Northern Inactive Landfill Extension (NILE), Southern Inactive Landfill (SIL), Southern Inactive Landfill Extension (SILE), Western Inactive Drum Site (WIDS), and the Southeastern Inactive Landfill (SEIL). Materials disposed of in these areas were primarily non-hazardous and included demolition debris, garbage, asbestos from brake linings, and possibly ash from the Deactivation Furnace and explosives sludges. The WIDS was known to have received drums. Information gathered during a site visit on June 2-3, 1992 suggest that most of the drums accessible at the ground surface are empty and are no longer presenting a threat to the environment; however, one drum was observed to contain liquid material and appeared to be approximately one third full. The results of the RI field investigation suggest that materials disposed in the WIDS have not had an observable negative affect on the environment. Additional field work is presently being performed to verify that the drums are not causing environmental degradation. Any drums that are determined to be having a negative affect will be removed.

A more complete description of this operable unit can be found in the RI report which is part of the Administrative Record for this operable unit. The Administrative Record is available to the public through the information repositories which are located at the Umatilla Depot Activity Public Affairs Office, the Hermiston Public Library, and at U.S. EPA Oregon Operations Office in Portland, Oregon.

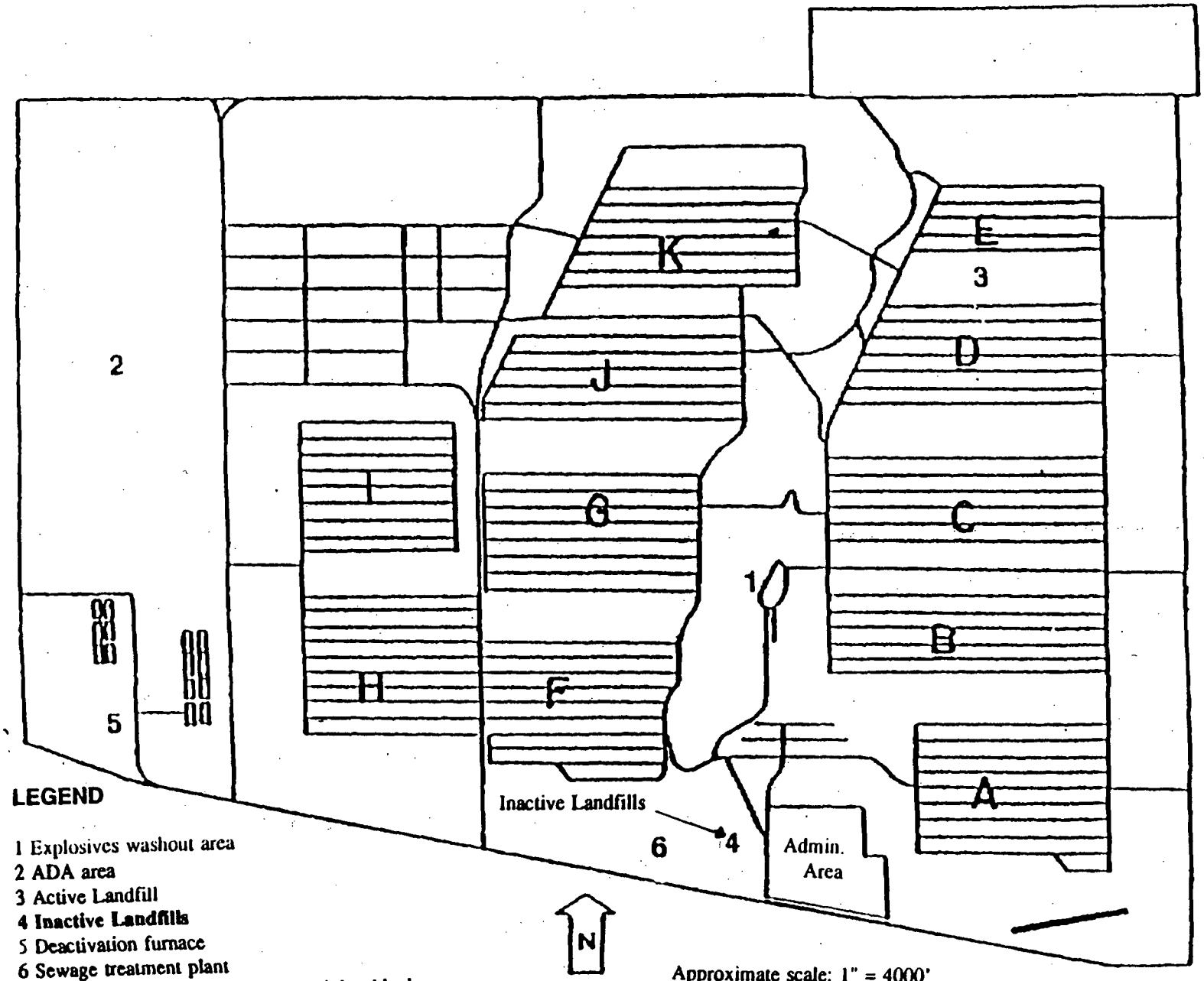

Figure 2: Overview of UMDA Layout

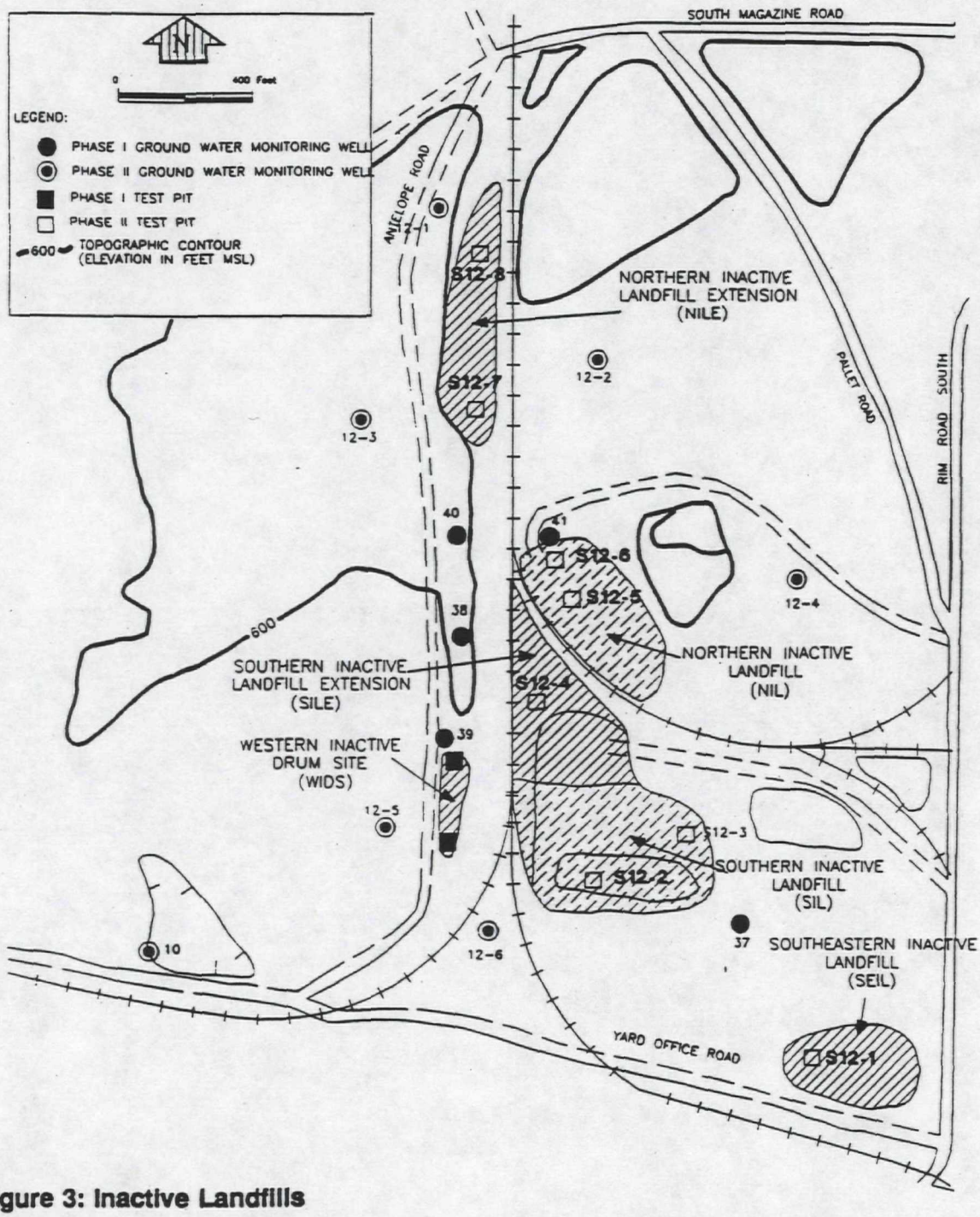

Figure 3: Inactive Landfills

PREPARED FOR: UMATILLA			Modified from: Final Remedial Investigation Report for the Umatilla Depot Activity, Hermiston, OR, August, 1992	TITLE: INACTIVE LANDFILLS
DATE: SEPT. 1992	SCALE: AS SHOWN	DWG. NO.: 67062-002		

2.2 Site History and Enforcement Activities

2.2.1 Site History

Disposal activities at the Inactive Landfills occurred from the early 1940's into the mid-1980's. According to UMDA personnel interviewed, much of the disposal activity ceased in the mid-1960's when the Active Landfill opened. There are no disposal records for these sites, and disposal was uncontrolled. Information on historic activities was derived from review of aerial photographs and interviews with UMDA employees. Historic operations of the six former disposal areas are described in Table 1. This table was based on the historic aerial photographs review summary presented in the RI report completed in 1992. This summary shows that each of the six sites became operational during the 1940's and early 1950's. Estimates of initiation and cessation of disposal activates at the various landfill sites are approximate and are limited by the fact that the photographs were taken on an infrequent schedule.

According to the review summary, the SIL, SILE, NILE, and SEIL appear to have been the first sites to be used. The aerial photograph review suggests that the six sites were used at random during their period of operation. Although interviews of site workers indicated that the majority of disposal activity ceased in the mid-1960's when the Active Landfill became operational, the aerial photograph review shows that several of the smaller sites continued to receive small amounts of waste into the mid-1980's (Table 1).

The two larger landfills, the SIL and NIL, are former gravel pits. When gravel operations ceased, the sites were reportedly used for the disposal of garbage and building materials. Materials reportedly disposed at these sites includes: garbage, building materials, and grass clippings, and possibly explosives sludges and ash from the Deactivation Furnace.

UMDA was included in the Army's Installation Restoration Program in October 1978. An Initial Installation Assessment was performed in December 1978, to evaluate the potential for past and present base operations to affect general environmental quality at and around the base. This investigation mentioned the ILOU, but did not recommend any further action.

In 1985, the Army submitted an application to the EPA for approval of plans to construct and operate an incinerator for chemical munitions destruction. To receive authorization, EPA required that corrective actions be taken for all previous releases of hazardous materials that had occurred at UMDA. EPA conducted a Resource Conservation and Recovery Act (RCRA) Facility Assessment to identify the areas that would require corrective action. EPA released a final report in July 1987, summarizing their results. This report listed the inactive landfills as one of the areas that should be addressed. In response, the Army and Argonne National Laboratory jointly developed a work plan to address the EPA's concerns.

Based primarily on contamination discovered at the Explosives Washout Lagoon (a site being addressed in another operable unit at the base), UMDA was placed on the National Priorities List (NPL) in July of 1987. In 1989, a Federal Facilities Agreement (FFA) was signed formally identifying the Army as the lead organization responsible for taking environmental response actions at UMDA. The FFA provided the framework for the

Table 1: Summary of Historic Operations at the Inactive Landfill Sites

SIL	1949	Gravel pit with small pile of debris observed
	1951	Disposal activities observed
	⇓	
	1975	Debris no longer visible, some landfilling has occurred since 1972; disposal area appears wetter than its surroundings
	1980	Site appears inactive
	1988	Two oblong objects, possibly tanks or trailers are observed in pit; ground scarring is visible
SILE	1949	Objects observed to be stored south of the road, dark toned pit with several objects in it between the road and rail spur
	1951	No change
	1956	Pit has been landfilled to grade; site appears to be used for staging prior to disposal at other areas; no disposal activities observed
	⇓	
	1970	Abundant materials stored at site
	1972	Less materials stored at site
	1975	No materials observed at site
	1977	Some materials observed at site
	1980	Site appears to be revegetating
	1988	Site appears to be revegetating
NIL	1949	Gravel pit appears to be clean, trenches are empty
	1951	Possible evidence of disposal activity observed
	1956	Disposal activities observed
	1958	No additional waste since 1956
	⇓	
	1965	No additional waste since 1956
	1970	Northern portion of site is at grade
	1972	No change observed
	⇓	
	1977	Evidence of disposal activity observed
	1980	Site recently graded, portions revegetating
	1988	Site revegetating

Notes:
Arrows indicate summary based on information contained in the Final Remedial Investigation Report, August, 1992.

SIL - Southern Inactive Landfill.
SILE - Southern Inactive Landfill Extension.
NIL - Northern Inactive Landfill.

Table 1: Summary of Historic Operations at the Inactive Landfill Sites (continued)

SEIL	1949 ⇓ 1958 1964 1965 1970 1975 ⇓ 1988	Evidence of disposal activities observed Area graded, shallow pit visible to the southwest Site revegetated, though pit discernable Materials stored adjacent to shallow pit Evidence of activity (ground scarring) Shallow pit is newly graded Evidence of limited disposal activity since 1980
NILE	1949 ⇓ 1964 1970 1972 1975 1977 1980 1988	Disposal area operational Disposal activities slowed/closed Evidence of disposal activities observed Disposal area almost filled to grade Disposal activities observed in the south portion of the site Area graded, no disposal activities observed Evidence more fill materials added, site appears scarred Little change
WIDS	1949 ⇓ 1956 ⇓ 1964 1965 1970 ⇓ 1975 ⇓ 1988	An open pit is visible with no evidence of disposal activity Little change, a couple small dark objects observed on floor of pit Evidence of disposal activity observed North end of pit has been filled Disposal activities observed; sewage pipeline installed through the pit No changes since 1972 Evidence of disposal activity since 1980 observed

Notes:
Arrows indicate summary based on information contained in the Final Remedial Investigation Report, August, 1992.

SEIL - Southeastern Inactive Landfill.
NILE - Northern Inactive Landfill Extension.
WIDS - Western Inactive Drum Site.

Source: Final Remedial Investigation Report, August, 1992.

response actions and specified 33 sites, identified by EPA during their RCRA Facility Assessment, that required action. Since that time, the Army has been working with various environmental engineering and consulting firms to ensure that all identified sites are characterized and appropriate corrective actions are taken.

2.2.2 Enforcement Activities

There have been no enforcement actions taken regarding this site.

2.3 Highlights of Community Participation

A Public Involvement and Response Plan for UMDA was prepared in May of 1990 to meet the public participation requirements of CERCLA. This plan includes a general discussion of UMDA and community background, and outlines the goals and objectives of the public involvement plan. Activities designed to ensure that the public is adequately informed of UMDA environmental conditions include, for example:

- Public meetings to discuss issues of concern and project activities. Thus far, two public meetings have been held to discuss the progress of the environmental investigation at UMDA.

- Technical Review Committee (TRC) meetings have been held, one every quarter, since February of 1989 to keep local officials and interested parties informed. There have been 15 such meetings to date. The TRC is made up of local officials and interested citizens.

- Written communication, fact sheets and press releases to inform the public of milestones achieved in the environmental investigation of UMDA, request their participation in TRC meetings or community interviews or inform them of remedial activities, public meetings or any other items of note.

- Interviews of local citizens to determine their level of awareness of site activities.

- Public comment periods of not less than 30 days on proposed remedial actions.

- A local information repository available for the public to review.

A summary of the ILOU Proposed Plan was presented to the TRC on August 12, 1992. The Proposed Plan was released for a 30 day public comment period extending from August 31, 1992 until September 30, 1992. A public meeting was held at the Armand Larive Junior High School in Hermiston on September 15, 1992 to solicit input on the no-action alternative proposed for the site. At the meeting, a summary of the results of the RI was presented and representatives from the Army, EPA, ODEQ, and Arthur D. Little, Inc. (an environmental engineering consulting firm) gave the public an opportunity to ask questions about the site and the proposed remedial alternative. A responsiveness summary which should include comments received and the Army's response(s) is attached at the end of this document. However, no comments or questions were received during the comment period. The remedy documented in this ROD has not been modified from the proposed alternative presented in the Proposed Plan.

2.4 Scope and Role of Operable Unit or Response Action

Due to the large size of UMDA, and the variety of potential contaminants and discrete sites, it has been divided into the following eight Operable Units (OUs).

- Inactive Landfills OU;
- Active Landfill OU;
- Explosives Washout Lagoons Ground Water OU;
- Ammunition Demolition Activity (ADA) Area Sites OU;
- Miscellaneous UMDA Sites OU;
- Explosives Washout Plant (Building 489) OU;
- Explosives Washout Lagoons Soils OU; and
- Deactivation Furnace Soils OU.

This ROD addresses the Inactive Landfills OU. A preferred remedy has also been proposed or selected for three of the other OUs. The soils at the Deactivation Furnace Soils OU are contaminated with metals, primarily lead. The proposed remedy will require that soils containing 500 mg/kg or more of lead be excavated and treated by solidification/stabilization. The option currently proposed for the treated soil is disposal in the Active Landfill.

A no-action remedy has been proposed for the Active Landfill OU. Data gathered during the RI indicates that the Active Landfill does not pose a significant threat and therefore actions to protect human health and the environment are not necessary. Although no further action will be taken under CERCLA, the site is scheduled to be closed and capped in accordance with ODEQ requirements over the next two years. In addition, as part of the closure requirements, ground water quality around the site will be monitored for a minimum of five years to ensure that it is not being negatively affected by the landfill.

The Explosives Washout Lagoons Soils OU was the subject of a final ROD in September 1992 which documented the process involved in selecting composting as the preferred remedy for the explosives contaminated soils. The rest of the OUs at UMDA are currently at the remedial alternative evaluation and feasibility study phase of activity.

This ROD addresses the Inactive Landfills at UMDA. Based on the results of the RI, which includes the results of the risk assessment, the Army, EPA and ODEQ determined that the ILOU did not pose a significant threat to human health or to the environment, and that no further action was necessary; consequently, a FS of possible remedial alternatives was not performed. It was decided that sufficient information had been collected during the RI to justify proceeding directly to the Proposed Plan.

Because the ILOU was determined not to pose a significant threat or to be a significant source of contaminants, the Army, EPA, and ODEQ have selected no-action as the final remedy for this OU.

2.5 Summary of Site Characteristics

Over the last 15 years, several environmental investigations have been performed at UMDA. There have been two significant efforts directed specifically at the Inactive Landfills. These investigations consisted of both record and field investigations. The first investigation was performed in 1988, and the second was in 1991-92.

The records investigation of both efforts included review of existing files and disposal records and interviews with former UMDA employees to gather information on general site activities. The second investigation also included review of aerial photographs of the ILOU dating from 1949 through 1988 to gain additional insight on historic operations.

The initial field investigation was performed in 1988. At that time, only three of the landfill sites had been identified. Field activities, including the installation and sampling of five ground water monitoring wells, and the excavation of two test pits, addressed only the NIL, SIL and WIDS (Figure 3). All of the ground water monitoring wells were installed into the alluvial aquifer. The two test pits were excavated in the WIDS and four soil samples were collected from each test pit at four depths. The ground water samples were analyzed for the presence of explosives, volatile organic compounds, semi-volatile organic compounds, pesticides, priority pollutant metals, cyanide, and total organic carbon. Soil samples were analyzed for the same list of analytes with the exception of total organic carbon.

Ground water was measured at depths ranging from 87 to 105 feet below the ground surface, at elevations of 494 to 499 feet above MSL. Local agricultural irrigation systems were found to have a strong affect on the direction of ground water flow at the Inactive Landfills. Ground water was observed to flow to the southeast under the influence of the irrigation system. When the pumping ceases, the natural gradient causes ground water to flow to the northwest. Analytical results of the soil and ground water sampling conducted during the first investigation are presented in Tables 2 and 3, respectively. The report conclusions are summarized as follows:

- *Soil Investigation Results.* Analysis of the eight soil samples detected only the following six of 13 priority pollutant metals: beryllium, chromium, copper, lead, nickel, and zinc. None of the other analytes were detected. Concentrations of the six metals were generally within the background concentrations at UMDA determined during the investigation. The only metal that slightly exceeded its background concentration was copper, at 85 ug/g, in a sample collected from a depth of five feet below grade. Background concentrations of copper were found to range from 20 to 60 ug/g.

  The subsurface soil samples collected from the WIDS did not contain any significant contamination. Based upon results of this sampling event, the WIDS is not believed to be a source of contamination.

- *Ground Water Investigation Results.* The ground water gradient in the vicinity of the Inactive Landfills was observed to be relatively flat, with a slight gradient toward the southeast from July to October, and again in February and March. The flow direction changed to east and northeast from November to January and to the north and northeast from April to June. The greatest change in ground water flow direction was observed between the months of June and July, when flow went from north to south-southeast. The local ground water flow is nearly the reverse of regional flow because of heavy pumpage for irrigation, but is expected to revert back to regional flow patterns when the irrigation wells are not in use.

  The only compound detected at elevated concentrations was nitrate/nitrite, which exceeded drinking water standards in four wells. Low concentrations of metals were detected in the ground water but were below drinking water standards. One sample contained trace concentrations of tetryl, an explosive, but is not considered significant.

  To confirm the presence of nitrate/nitrite at concentrations above the drinking water standards and define upgradient ground water quality, supplemental ground water investigation activities were recommended.

The second phase of investigation included the installation of six ground water monitoring wells, all completed in the alluvial aquifer. These wells were placed to: further define ground water flow directions and background ground water quality; assist in determining if the elevated concentrations of nitrate/nitrite were due to the Inactive Landfills or to regional background conditions; and evaluate the three additional Inactive Landfill sites (Figure 3). These sites were identified upon review of the historic aerial photographs, and the original scope was amended to ensure that all six former disposal areas were characterized. Eight test pits were excavated to complete soil sampling at each of the six former disposal areas.

Two rounds of ground water samples were collected from the five existing and six new ground water monitoring wells installed at ILOU. Analyses performed on the ground water samples included: Target Analyte List (TAL) inorganics (which includes metals, nonmetallic elements and cyanide), volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated-biphenyls (PCBs), explosives and nitrate/nitrite. Analytical results of the second and third ground water sampling events are presented in Table 4. Depths to ground water ranged from 140 to 152 feet, and elevations ranged from 491 to 520 feet MSL.

A total of 24 soil samples were collected from the eight test pits excavated in the five former disposal areas not sampled during the first investigation. Samples were collected at three depths in each pit, 2.5, 5 and 10 feet. The soil sampling and analysis program was performed to determine if landfilling activities had any affect on local soils. Materials encountered during the test pit activities included metal scrap material, orange and yellow discolored soil, slag-like material, wood, charred wood, a drum and miscellaneous trash. Results of the laboratory analysis on the soil samples can be found in Table 5. Report summaries of the soil and ground water investigations are presented in the following sections.

TABLE 2

Contaminants Detected in Subsurface Soil Samples Collected in the Inactive Landfills Area Phase I Investigation

	Concentration at Given Sample Depths (ug/g)							
	IL-1				IL-2			
Contaminant	2.5'	5.0'	7.5'	10.0'	2.5'	5.0'	7.5'	10.0'
Explosives	None	None	None	None	None	None	None	None
Nitrate/Nitrite	<500	<500	<500	<500	<500	<500	<500	<500
VOAs	None	None	None	None	None	None	None	None
BNAs	None	None	None	None	None	None	None	None
Cyanide	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64
Metals								
Ag	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65
As	<5.70	<5.70	<5.70	<5.70	<5.70	<5.70	<5.70	<5.70
Be	<0.33	2.70	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Cd	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70	<0.70
Cr	7.72	10.2	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50
Cu	26.7	85.0	29.8	41.8	24.9	26.3	27.3	20.8
Hg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Ni	7.27	7.86	7.60	6.24	5.30	7.89	10.8	8.48
Pb	<4.78	7.28	<4.78	<4.78	<4.78	<4.78	<4.78	<4.78
Sb	<25.3	<25.3	<25.3	<25.3	<25.3	<25.3	<25.3	<25.3
Se	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10
Tl	<7.93	<7.93	<7.93	<7.93	<7.93	<7.93	<7.93	<7.93
Zn	62.4	56.9	<52.0	<52.0	<52.0	<52.0	63.9	<52.0

Note:

None = Group of analytes not detected above detection limits
Source: Final Remedial Investigation Report, August, 1992

TABLE 3

Contaminants Detected in Ground Water Samples Collected in the Inactive Landfills Area Phase I Investigation

	Ground Water						
Contaminant	MW-37 (ug/L)	MW-38 (ug/L)	MW-39 (ug/L)	MW-40 (ug/L)	MW-41 (ug/L)	TP-ILa (ug/L)	FB-ILb (ug/L)
Explosives	None	None	None	1.24	None	N/A	None
Tetryl							
Nitrate/Nitrite	<5,000	10,900	12,600	10,900	9,240	N/A	<5,000
Cyanide	<16.0	<16.0	<16.0	<16.0	<16.0	N/A	<16.0
VOAs	None	None	None	None	None		
Benzene						0.64	N/D
Chloroform						N/D	17.0
Tetrachloro-ethylene						0.82	
BNAs	None			None	None	N/A	
UNK598	N/D	N/D	12.0				
UNK592	N/D	7.00	N/A				
TOC	2,600	2,900	3,800	2,000	2,700	N/A	1,500
Metals						N/A	
Ag	<0.19	<0.19	<0.19	<0.19	<0.19		<0.19
As	<5.00	<5.00	<5.00	5.18	<5.00		<5.00
Be	<0.103	<0.103	<0.103	<0.103	<0.103		<0.103
Cd	<5.10	<5.10	<5.10	<5.10	<5.10		<5.10
Cr	<37.5	<37.5	<37.5	<37.5	<37.5		<37.5
Cu	4.72	5.47	6.75	3.75	3.54		4.61
Hg	<0.17	<0.17	<0.17	<0.17	<0.17		<0.17
Pb	6.37	<2.50	4.55	4.65	3.34		5.86
Ni	18.4	<9.60	10.60	67.6	33.1		46.6
Sb	<3.00	<3.00	<3.00	<3.00	<3.00		<3.00
Se	<5.00	<5.00	<5.00	<5.00	<5.00		<5.00
Tl	<5.00	<5.00	<5.00	<5.00	<5.00		<5.00
Zn	1,400	1,100	1,400	1,100	910		1,000

Notes:

None = Group of analytes not detected above detection limits
N/A = Analyte or group of analytes not analyzed
N/D = Analyte not detected above detection limit
a = Trip blank
b = Field (rinse) blank

Source: Final Remedial Investigation Report, August 1992

TABLE 4

Ground Water Analytical Results
Phase 2 Investigation
Inactive Landfills

D&M GW Data - 10/7/91

MAP ID		12-1	12-1	12-2	12-2	12-3	12-3	12-4	
SITE ID		G12A001	G12B001	G12A002	G12B002	G12A003	G12B003	G12A004	
FIELD ID		MWK7*122	MWK7*123	MWK7*124	UMWK7*88	UMWK7*89	UMWK7*90	UMWK7*94	
S. DATE		17-Oct-90	17-Jan-91	18-Oct-90	18-Jan-91	17-Oct-90	17-Jan-91	18-Oct-90	
DEPTH		105.0	105.0	101.0	101.0	103.0	103.0	98.0	
MATRIX		CGW	CGW	CGW	CGW	CGW	CGW	CGW	*COMPARISON*
UNITS	*CRLs*	UGL	UGL	UGL	UGL	UGL	UGL	UGL	*CRITERIA*
TAL Inorganics									
ANTIMONY (GFAA)	*3.03*	[10.4]	5	LT 3.03	LT 3.03	LT 3.03	LT 3.03	LT 3.03	*5*
ARSENIC	*0.25*	6.72	7.36	5.65	6.18	6.61	6.5	4.37	*50*
BARIUM	*5*	18.1	28.3	33.3	28.5	33.9	30.6	42.3	*1000*
BERYLLIUM	*5*	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	NSA
CALCIUM	*500*	49000	53000	59000	55000	59000	54000	59000	*NSA*
CHROMIUM	*6*	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	*100*
COPPER	*8.1*	19.2	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	*1300*
IRON	*42.7*	LT 38.8	LT 38.8	LT 38.8	LT 38.8	LT 38.8	LT 38.8	LT 38.8	*300*
LEAD (GFAA)	*1.26*	LT 1.26	LT 1.26	LT 1.26	LT 1.26	1.41	LT 1.26	2.39	*15*
MAGNESIUM	*500*	14000	15200	16000	16100	17200	15800	16900	*NSA*
MANGANESE	*2.75*	LT 2.75	6.42	LT 2.75	LT 2.75	LT 2.75	6.99	LT 2.75	*50*
NICKEL	*34.3*	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	*100*
POTASSIUM	*375*	6540	5310	4670	5370	5300	5660	4810	*NSA*
SILVER	*0.189*	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	*NSA*
SODIUM	*500*	23600	21600	24300	22600	26800	22400	28600	*100000*
VANADIUM (GFAA)	*3.82*	[33.6]	[35.8]	[31.9]	[33.1]	[28.6]	[33.7]	[27.2]	*20*
ZINC	*21.1*	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	*5000*
Explosives									
RDX	*2.11*	4.03 C	LT 2.11	3.58 U	4.37 U	LT 2.11	3.49 U	LT 2.11	*10*
TCL VOAs									
	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
TCL BNAs									
	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
BNA TICs									
DI-N-BUTYL PHTHALATE	*N/A*	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	NSA
TOTAL UNKNOWN TICs	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
Other Inorganics									
NITRATE/NITRITE	10	4900	6000	8000	7500	9500	7000	9000	10000

TABLE 4 (cont.)

Ground Water Analytical Results
Phase 2 Investigation
Inactive Landfills

D&M GW Data - 10/7/91

MAP ID		12-4	12-5	12-5	12-6	12-6	12-6	MW-37	
SITE ID		G12B004	G12A0051	G12B005	G12A006	G12B006	G12B006	G12A037	
FIELD ID		MWK7*122	MWK7*123	MWK7*124	UMWK7*88	UMWK7*89	UMWK7*90	UMWK7*94	
S. DATE		18-Jan-91	18-Oct-90	17-Jan-91	17-Oct-90	17-Jan-91	12-Feb-91	19-Oct-90	
DEPTH		98.0	92.0	92.0	90.0	90.0	90.0	87.0	
MATRIX		CGW	CGW	CGW	CGW	CGW	CGW	CGW	*COMPARISON*
UNITS	*CRLs*	UGL	UGL	UGL	UGL	UGL	UGL	UGL	*CRITERIA*
TAL Inorganics									
ANTIMONY (GFAA)	*3.03*	LT 3.03	[5.18]	LT 3.03	[5.62]	LT 3.03	NT	LT 3.03	*5*
ARSENIC	*0.25*	4.69	4.26	4.8	4.37	5.44	NT	4.26	*50*
BARIUM	*5*	35.1	40.4	36.8	31.7	41	NT	48.5	*1000*
BERYLLIUM	*5*	LT 5	LT 5	LT 5	LT 5	LT 5	NT	LT 5	NSA
CALCIUM	*500*	57000	66000	64000	70000	62000	NT	70000	*NSA*
CHROMIUM	*6*	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	NT	LT 6.02	*100*
COPPER	*8.1*	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	NT	LT 8.09	*1300*
IRON	*42.7*	LT 38.8	LT 38.8	LT 38.8	LT 38.8	LT 38.8	NT	LT 38.8	*300*
LEAD (GFAA)	*1.26*	LT 1.26	3.25	LT 1.26	LT 1.26	LT 1.26	NT	LT 1.26	*15*
MAGNESIUM	*500*	16800	18700	18200	19800	18100	NT	22000	*NSA*
MANGANESE	*2.75*	LT 2.75	LT 2.75	LT 2.75	LT 2.75	LT 2.75	NT	LT 2.75	*50*
NICKEL	*34.3*	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	NT	LT 34.3	*100*
POTASSIUM	*375*	5280	4800	5640	6170	5390	NT	4970	*NSA*
SILVER	*0.189*	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	NT	LT 0.25	*NSA*
SODIUM	*500*	25200	29400	24700	34500	27400	NT	36000	*100000*
VANADIUM (GFAA)	*3.82*	[30.6]	[24]	[27.9]	[26.3]	[29.3]	NT	[23.1]	*20*
ZINC	*21.1*	LT 21.1	LT 21.1	LT 21.1	30.8	LT 21.1	NT	LT 21.1	*5000*
Explosives									
RDX	*2.11*	3.34 U	5.83 U	LT 2.11	16.9 U	LT 2.11	NT	7.64 U	*10*
TCL VOAs									
	N/A	ND	ND	ND	ND	ND	NT	ND	NSA
TCL BNAs									
	N/A	ND	ND	ND	ND	ND	NT	ND	NSA
BNA TICs									
DI-N-BUTYL PHTHALATE	*N/A*	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	NT	LT 3.7	NSA
TOTAL UNKNOWN TICs	N/A	ND	ND	ND	ND	ND	NT	ND	NSA
Other Inorganics									
NITRATE/NITRITE	10	9400	10000	[11000]	[11000]	10000	NT	10000	10000

TABLE 4 (cont.)

Ground Water Analytical Results
Phase 2 Investigation
Inactive Landfills

D&M GW Data - 10/7/91

MAP ID		MW-37	MW-38	MW-38	MW-39	MW-39	MW-40	MW-40	
SITE ID		G12B037	G12A038	G12B038	G12A039	G12B039	G12A040	G12B040	
FIELD ID		MWK7*122	MWK7*123	MWK7*124	UMWK7*88	UMWK7*89	UMWK7*90	UMWK7*94	
S. DATE		20-Jan-91	18-Oct-90	18-Jan-91	19-Oct-90	20-Jan-91	18-Oct-90	18-Jan-91	
DEPTH		87.0	101.0	101.0	97.0	97.0	102.0	102.0	
MATRIX		CGW	CGW	CGW	CGW	CGW	CGW	CGW	*COMPARISON*
UNITS	*CRLs*	UGL	UGL	UGL	UGL	UGL	UGL	UGL	*CRITERIA*
TAL Inorganics									
ANTIMONY (GFAA)	*3.03*	LT 3.03	LT 3.03	LT 3.03	3.3	LT 3.03	LT 3.03	LT 3.03	*5*
ARSENIC	*0.25*	5.12	4.48	5.12	4.16	4.8	5.44	5.76	*50*
BARIUM	*5*	44.5	31.1	30.6	33.4	33.1	31.6	27.5	*1000*
BERYLLIUM	*5*	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	LT 5	NSA
CALCIUM	*500*	71000	59000	64000	62000	70000	59000	53000	*NSA*
CHROMIUM	*6*	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	LT 6.02	*100*
COPPER	*8.1*	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	LT 8.09	*1300*
IRON	*42.7*	LT 38.8	LT 38.8	49.6	LT 38.8	LT 38.8	LT 38.8	LT 38.8	*300*
LEAD (GFAA)	*1.26*	LT 1.26	LT 1.26	LT 1.26	1.41	LT 1.26	1.63	LT 1.26	*15*
MAGNESIUM	*500*	22000	17000	17400	17400	17200	17000	15500	*NSA*
MANGANESE	*2.75*	LT 2.75	LT 2.75	LT 2.75	LT 2.75	LT 2.75	LT 2.75	LT 2.75	*50*
NICKEL	*34.3*	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	LT 34.3	*100*
POTASSIUM	*375*	5690	4740	5680	4870	5650	5160	5280	*NSA*
SILVER	*0.189*	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	LT 0.25	*NSA*
SODIUM	*500*	28400	27000	23200	26900	23200	26600	22100	*100000*
VANADIUM (GFAA)	*3.82*	[28.4]	[26]	[28.8]	[24.2]	[30.4]	[26.3]	[32.1]	*20*
ZINC	*21.1*	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	LT 21.1	*5000*
Explosives									
RDX	*2.11*	LT 2.11	12.5 U	LT 2.11	LT 2.11	LT 2.11	3.61 U	3.9 U	*10*
TCL VOAs									
	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
TCL BNAs									
	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
BNA TICs									
DI-N-BUTYL PHTHALATE	*N/A*	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	LT 3.7	NSA
TOTAL UNKNOWN TICs	N/A	ND	ND	ND	ND	ND	ND	ND	NSA
Other Inorganics									
NITRATE/NITRITE	10	10000	7000	9300	9000	9900	9000	6500	10000

TABLE 4 (cont.)

Ground Water Analytical Results
Phase 2 Investigation
Inactive Landfills

D&M GW Data - 10/7/91

MAP ID		MW-41	MW-41	
SITE ID		G12A041	G12B041	
FIELD ID		MWK7*122	MWK7*123	
S. DATE		19-Oct-90	20-Jan-91	
DEPTH		102.0	102.0	
MATRIX		CGW	CGW	*COMPARISON*
UNITS	*CRLs*	UGL	UGL	*CRITERIA*
TAL Inorganics				
ANTIMONY (GFAA)	*3.03*	LT 3.03	LT 3.03	*5*
ARSENIC	*0.25*	4.9	5.76	*50*
BARIUM	*5*	27.2	25.2	*1000*
BERYLLIUM	*5*	LT 5	LT 5	NSA
CALCIUM	*500*	59000	52000	*NSA*
CHROMIUM	*6*	LT 6.02	LT 6.02	*100*
COPPER	*8.1*	LT 8.09	LT 8.09	*1300*
IRON	*42.7*	LT 38.8	LT 38.8	*300*
LEAD (GFAA)	*1.26*	LT 1.26	LT 1.26	*15*
MAGNESIUM	*500*	16700	14700	*NSA*
MANGANESE	*2.75*	LT 2.75	LT 2.75	*50*
NICKEL	*34.3*	LT 34.3	LT 34.3	*100*
POTASSIUM	*375*	4870	5020	*NSA*
SILVER	*0.189*	LT 0.25	LT 0.25	*NSA*
SODIUM	*500*	25800	21100	*100000*
VANADIUM (GFAA)	*3.82*	[26.4]	[34.4]	*20*
ZINC	*21.1*	LT 21.1	LT 21.1	*5000*
Explosives				
RDX	*2.11*	10.8 U	LT 2.11	*10*
TCL VOAs				
	N/A	ND	ND	NSA
TCL BNAs				
	N/A	ND	ND	NSA
BNA TICs				
DI-N-BUTYL PHTHALATE	*N/A*	LT 3.7	LT 3.7	NSA
TOTAL UNKNOWN TICs	N/A	ND	ND	NSA
Other Inorganics				
NITRATE/NITRITE	10	8500	7800	10000

NOTES:

GT = Greater Than
LT = Less Than
NA = Not Available
ND = Not Detected
NSA = No Standard Available
NT = Not Tested
S = Results Based on Internal Standards
TICs = Compounds for Which No Standard for Identification
U = Unconfirmed
[ ] = Detected concentration exceeds comparison criterion

Source: Final Remedial Investigation Report, August, 1992

TABLE 5

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-1	S12-1	S12-1	S12-2	S12-2	S12-2	S12-3	
SITE ID		S12A001	S12A001	S12A001	S12A002	S12A002	S12A002	S12A003	
FIELD ID		MWK7*122	MWK7*123	MWK7*124	UMWK7*88	UMWK7*89	UMWK7*90	UMWK7*94	
S. DATE		24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	
DEPTH		2.5	6.5	10.0	2.5	6.0	10.0	2.5	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*COMPARISON CRITERIA*
TAL Inorganics									
ALUMINUM	*14.1*	5100	4240	660	7500	6400	7600	6800	*8604*
ARSENIC	*0.25*	1.55	1.86	1.47	1.89	1.61	1.69	2.54	*5.24*
BARIUM	*29.6*	88.2	81.2	111	134	124	121	150	*233*
BERYLLIUM	*1.86*	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	*1.86*
CALCIUM	*59*	9600	14000	13000	6730	11000	14000	13000	*29006*
CHROMIUM	*12.7*	LT 12.7	LT 12.7	LT 12.7	[39.5]	LT 12.7	LT 12.7	LT 12.7	*32.7*
COPPER	*58.6*	LT 58.6	LT 58.6	LT 58.6	LT 58.6	LT 58.6	LT 58.6	[247]	*58.6*
IRON	*50*	23000	21000	21000	[28000]	24000	[27000]	[30000]	*26233*
LEAD (GFAA)	*0.177*	5.75	7.2	3.63	NT	NT	4.34	NT	*8.37*
LEAD (ICP)	*6.62*	NT	NT	NT	[16.8]	[11]	NT	[52.4]	*8.37*
MAGNESIUM	*50*	6290	6120	4690	5130	6210	7060	6170	*8585*
MANGANESE	*0.275*	453	403	556	539	472	493	543	*874*
MERCURY	*0.05*	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	[0.346]	*0.056*
NICKEL	*12.6*	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	*12.6*
POTASSIUM	*37.5*	1020	858	611	1780	1250	1400	1470	*2179*
SILVER	*0.025*	0.035	[0.043]	LT 0.025	[0.041]	[0.04]	[0.076]	[2.4]	*0.038*
SODIUM	*150*	547	592	690	636	628	759	927	*978*
VANADIUM (ICP)	*13*	112	97.7	103	114	92.1	[133]	[137]	*131*
ZINC	*30.2*	76.3	71.2	69.9	[364]	[97.7]	87.6	[447]	*94*
Explosives	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TCL VOAs									
CHLOROFORM	*0.001*	0.003	0.003	0.002	LT 0.001	0.003	LT 0.001	LT 0.001	*NSA*
TRICHLOROFLUOROMETHANE	*0.006*	0.008	0.008	0.005	LT 0.006	0.007	LT 0.006	LT 0.006	*NSA*
TCL BNAs									
BIS(2-ETHYLHEXYL) PHTHALATE	*0.62*	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	*NSA*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-1	S12-1	S12-1	S12-2	S12-2	S12-2	S12-3	
SITE ID		S12A001	S12A001	S12A001	S12A002	S12A002	S12A002	S12A003	
FIELD ID		MWK7*122	MWK7*123	MWK7*124	UMWK7*88	UMWK7*89	UMWK7*90	UMWK7*94	
S. DATE		24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	
DEPTH		2.5	6.5	10.0	2.5	6.0	10.0	2.5	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*CRITERIA*
BNA TICs									
2,6,10,14-TETRAMETHYLPENTAD	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-1-OL	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-ONE	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
CYCLOHEXENE OXIDE	*N/A*	N/D	N/D	N/D	0.215 S	N/D	N/D	N/D	*NSA*
HEXADECANOIC ACID	*N/A*	N/D	N/D	N/D	0.215 S	N/D	N/D	N/D	*NSA*
TOLUENE	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TOTAL UNKNOWN TICs	*N/A*	N/D	N/D	N/D	(4) 1.4	(1) 0.211	N/D	N/D	*NSA*
TCL Pesticides/PCBs									
DDD	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	0.057	*NSA*
DDE	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	0.014	*NSA*
DDT	*0.007*	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.071	*NSA*
PCB-1260	*1.08*	LT 0.08	LT 0.08	LT 0.08	0.174	LT 0.08	LT 0.08	LT 0.08	*NSA*
Other Inorganics									
NITRATE/NITRITE	*0.6*	[13]	[20]	[12]	0.938	3.29	2.81	0.876	*9.9*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-3	S12-3	S12-4	S12-4	S12-4	S12-5	S12-5	
SITE ID		S12A003	S12A003	S12A004	S12A004	S12A004	S12A005	S12A005	
FIELD ID		MWK7*120	MWK7*121	UMWK7*91	UMWK7*92	UMWK7*93	MWK7*134	MWK7*135	
S. DATE		24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	25-Sep-90	25-Sep-90	
DEPTH		6.5	10.0	2.5	6.5	10.0	2.5	6.5	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*CRITERIA*
TAL Inorganics									
ALUMINUM	*14.1*	3840	4700	7300	5600	5200	5439	3595	*8604*
ARSENIC	*0.25*	1.71	1.24	2.28	1.25	1.85	1.66	1.77	*5.24*
BARIUM	*29.6*	94.3	152	128	103	118	132	88.8	*233*
BERYLLIUM	*1.86*	LT 1.86	LT 1.86	LT 1.86	LT 1.86	[3.92]	LT 1.86	LT 1.86	*1.86*
CALCIUM	*59*	7700	9100	8000	5650	11000	11056	15510	*29006*
CHROMIUM	*12.7*	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	*32.7*
COPPER	*58.6*	LT 58.6	LT 58.6	LT 58.6	LT 58.6	[192]	LT 58.6	LT 58.6	*58.6*
IRON	*50*	18000	21000	26000	23000	[95000]	22127	15119	*26233*
LEAD (GFAA)	*0.177*	NT	NT	5.9	[9.65]	NT	7.35	3.79	*8.37*
LEAD (ICP)	*6.62*	[19.6]	[10.7]	NT	NT	[26.1]	NT	NT	*8.37*
MAGNESIUM	*50*	4800	5280	6800	5130	4740	6324	4574	*8585*
MANGANESE	*0.275*	361	448	577	481	670	500	305	*874*
MERCURY	*0.05*	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	*0.056*
NICKEL	*12.6*	LT 12.6	LT 12.6	LT 12.6	LT 12.6	[71]	LT 12.6	LT 12.6	*12.6*
POTASSIUM	*37.5*	874	923	1570	1440	1200	1712	791	*2179*
SILVER	*0.025*	[0.474]	[0.085]	[0.08]	0.031	[0.047]	0.034	0.033	*0.038*
SODIUM	*150*	534	653	675	499	569	592	576	*978*
VANADIUM (ICP)	*13*	71.8	100	127	116	105	77.1	43.2	*131*
ZINC	*30.2*	[161]	[100]	87.3	81.4	90.5	80	LT 30.2	*94*
Explosives	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TCL VOAs									
CHLOROFORM	*0.001*	0.004	0.003	0.003	0.004	0.005	LT 0.001	LT 0.001	*NSA*
TRICHLOROFLUOROMETHANE	*0.006*	0.008	0.007	0.008	0.009	0.008	LT 0.006	LT 0.006	*NSA*
TCL BNAs									
BIS(2-ETHYLHEXYL) PHTHALATE	*0.62*	LT 0.62	LT 0.62	1.37	LT 0.62	LT 0.62	LT 0.62	LT 0.62	*NSA*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-3	S12-3	S12-4	S12-4	S12-4	S12-5	S12-5	
SITE ID		S12A003	S12A003	S12A004	S12A004	S12A004	S12A005	S12A005	
FIELD ID		MWK7*120	MWK7*121	UMWK7*91	UMWK7*92	UMWK7*93	MWK7*134	MWK7*135	
S. DATE		24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	24-Sep-90	25-Sep-90	25-Sep-90	
DEPTH		6.5	10.0	2.5	6.5	10.0	2.5	6.5	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*CRITERIA*
BNA TICs									
2,6,10,14-TETRAMETHYLPENTAD	*N/A*	N/D	N/D	N/D	0.204 S	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-1-OL	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-ONE	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
CYCLOHEXENE OXIDE	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
HEXADECANOIC ACID	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TOLUENE	*N/A*	N/D	N/D	N/D	N/D	N/D	1.05 S	1.05 S	*NSA*
TOTAL UNKNOWN TICs	*N/A*	N/D	N/D	N/D	(4) 0.816	N/D	N/D	(1) 0.105	*NSA*
TCL Pesticides/PCBs									
DDD	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	*NSA*
DDE	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	0.014	LT 0.008	*NSA*
DDT	*0.007*	0.009	0.009	LT 0.007	0.009	LT 0.007	LT 0.007	LT 0.007	*NSA*
PCB-1260	*1.08*	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	*NSA*
Other Inorganics									
NITRATE/NITRITE	*0.6*	0.655	LT 0.6	LT 0.6	LT 0.6	LT 0.6	4.7	7.69	*9.9*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-5	S12-6	S12-6	S12-6	S12-7	S12-7	S12-7	
SITE ID		S12A005	S12A006	S12A006	S12A006	S12A007	S12A007	S12A007	
FIELD ID		MWK7*136	UMWK8*8	UMWK8*9	UMWK8*10	UMWK8*5	UMWK8*6	UMWK8*7	
S. DATE		25-Sep-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	
DEPTH		10.0	2.5	6.5	10.0	2.5	6.5	10.0	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*CRITERIA*
TAL Inorganics									
ALUMINUM	*14.1*	4816	195	4115	916	235	764	287	*8604*
ARSENIC	*0.25*	1.69	1.89	2.15	1.75	1.65	2.12	1.94	*5.24*
BARIUM	*29.6*	109	116	134	98.1	107	132	94.2	*233*
BERYLLIUM	*1.86*	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	LT 1.86	*1.86*
CALCIUM	*59*	11480	8356	9201	7545	9809	11926	10017	*29006*
CHROMIUM	*12.7*	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	LT 12.7	*32.7*
COPPER	*58.6*	LT 58.6	LT 58.6	[168]	LT 58.6	LT 58.6	LT 58.6	LT 58.6	*58.6*
IRON	*50*	19251	16800	18796	16817	21630	16887	17770	*26233*
LEAD (GFAA)	*0.177*	4.32	[9.25]	[8.66]	6.83	3.95	6.27	[9.01]	*8.37*
LEAD (ICP)	*6.62*	NT	NT	NT	NT	NT	NT	NT	*8.37*
MAGNESIUM	*50*	5476	5201	4801	4598	5484	4758	4558	*8585*
MANGANESE	*0.275*	396	424	417	377	411	447	363	*874*
MERCURY	*0.05*	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	LT 0.05	*0.056*
NICKEL	*12.6*	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	LT 12.6	*12.6*
POTASSIUM	*37.5*	1153	1206	876	1001	741	860	675	*2179*
SILVER	*0.025*	0.034	LT 0.025	[0.047]	LT 0.025	LT 0.025	0.035	0.035	*0.038*
SODIUM	*150*	561	478	448	499	535	557	556	*978*
VANADIUM (ICP)	*13*	64.7	59.3	53.5	57.3	77.6	56.1	53.7	*131*
ZINC	*30.2*	58.7	64.2	LT 30.2	55.7	64.8	LT 30.2	LT 30.2	*94*
Explosives	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TCL VOAs									
CHLOROFORM	*0.001*	LT 0.001	LT 0.001	LT 0.001	LT 0.001	LT 0.001	LT 0.001	LT 0.001	*NSA*
TRICHLOROFLUOROMETHANE	*0.006*	LT 0.006	LT 0.006	LT 0.006	LT 0.006	LT 0.006	LT 0.006	LT 0.006	*NSA*
TCL BNAs									
BIS(2-ETHYLHEXYL) PHTHALATE	*0.62*	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	LT 0.62	*NSA*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91									
MAP ID		S12-5	S12-6	S12-6	S12-6	S12-7	S12-7	S12-7	
SITE ID		S12A005	S12A006	S12A006	S12A006	S12A007	S12A007	S12A007	
FIELD ID		MWK7*136	UMWK8*8	UMWK8*9	UMWK8*10	UMWK8*5	UMWK8*6	UMWK8*7	
S. DATE		25-Sep-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	
DEPTH		10.0	2.5	6.5	10.0	2.5	6.5	10.0	
MATRIX		CSO	CSO	CSO	CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	UGG	UGG	UGG	*CRITERIA*
BNA TICs									
2,6,10,14-TETRAMETHYLPENTAD	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-1-OL	*N/A*	N/D	0.103 S	0.309 S	0.309 S	N/D	N/D	0.205 S	*NSA*
2-CYCLOHEXEN-ONE	*N/A*	N/D	N/D	0.206 S	0.206 S	N/D	N/D	0.205 S	*NSA*
CYCLOHEXENE OXIDE	*N/A*	N/D	N/D	1.03 S	1.03 S	N/D	N/D	1.03 S	*NSA*
HEXADECANOIC ACID	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TOLUENE	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TOTAL UNKNOWN TICs	*N/A*	N/D	N/D	N/D	N/D	N/D	N/D	N/D	*NSA*
TCL Pesticides/PCBs									
DDD	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	*NSA*
DDE	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	LT 0.008	*NSA*
DDT	*0.007*	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.007	LT 0.007	*NSA*
PCB-1260	*1.08*	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	LT 0.08	*NSA*
Other Inorganics									
NITRATE/NITRITE	*0.6*	6.84	1.73	0.802	1.02	LT 0.6	LT 0.6	LT 0.6	*9.9*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91						
MAP ID		S12-8	S12-8	S12-8	S12-8	
SITE ID		S12A008	S12A008	S12A008	S12A008D	
FIELD ID		UMWK8*1	UMWK8*2	UMWK8*3	UMWK8*4	
S. DATE		01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	
DEPTH		2.5	6.5	10.0	10.0	
MATRIX		CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	*CRITERIA*
TAL Inorganics						
ALUMINUM	*14.1*	4821	4004	4043	1021	*8604*
ARSENIC	*0.25*	[6.15]	2.68	2.2	1.82	*5.24*
BARIUM	*29.6*	[248]	144	114	118	*233*
BERYLLIUM	*1.86*	LT 1.86	LT 1.86	LT 1.86	LT 1.86	*1.86*
CALCIUM	*59*	15009	11578	9921	11902	*29006*
CHROMIUM	*12.7*	LT 12.7	LT 12.7	LT 12.7	LT 12.7	*32.7*
COPPER	*58.6*	[339]	LT 58.6	LT 58.6	LT 58.6	*58.6*
IRON	*50*	23669	20838	19887	21808	*26233*
LEAD (GFAA)	*0.177*	NT	NT	6.59	5.07	*8.37*
LEAD (ICP)	*6.62*	[133]	[21.3]	NT	NT	*8.37*
MAGNESIUM	*50*	6123	5207	5092	5733	*8585*
MANGANESE	*0.275*	594	457	401	421	*874*
MERCURY	*0.05*	LT 0.05	LT 0.05	LT 0.05	LT 0.05	*0.056*
NICKEL	*12.6*	[22]	LT 12.6	LT 12.6	LT 12.6	*12.6*
POTASSIUM	*37.5*	1094	862	738	771	*2179*
SILVER	*0.025*	[0.616]	[0.129]	0.035	LT 0.025	*0.038*
SODIUM	*150*	597	581	512	546	*978*
VANADIUM (ICP)	*13*	66.7	70.3	80.3	93.6	*131*
ZINC	*30.2*	[1065]	198]	73.3	81.3	*94*
Explosives	*N/A*	N/D	N/D	N/D	N/D	*NSA*
TCL VOAs						
CHLOROFORM	*0.001*	LT 0.001	LT 0.001	LT 0.001	LT 0.001	*NSA*
TRICHLOROFLUOROMETHANE	*0.006*	LT 0.006	LT 0.006	LT 0.006	LT 0.006	*NSA*
TCL BNAs						
BIS(2-ETHYLHEXYL) PHTHALATE	*0.62*	LT 0.62	LT 0.62	LT 0.62	LT 0.62	*NSA*

TABLE 5 (cont.)

Soil Analytical Results
Phase 2 Investigation
Inactive Landfills

Soil Data - 10/7/91						
MAP ID		S12-8	S12-8	S12-8	S12-8	
SITE ID		S12A008	S12A008	S12A008	S12A008D	
FIELD ID		UMWK8*1	UMWK8*2	UMWK8*3	UMWK8*4	
S. DATE		01-Oct-90	01-Oct-90	01-Oct-90	01-Oct-90	
DEPTH		2.5	6.5	10.0	10.0	
MATRIX		CSO	CSO	CSO	CSO	*COMPARISON*
UNITS	*CRLs*	UGG	UGG	UGG	UGG	*CRITERIA*
BNA TICs						
2,6,10,14-TETRAMETHYLPENTAD	*N/A*	N/D	N/D	N/D	N/D	*NSA*
2-CYCLOHEXEN-1-OL	*N/A*	0.205 S	0.206 S	N/D	N/D	*NSA*
2-CYCLOHEXEN-ONE	*N/A*	N/D	N/D	N/D	N/D	*NSA*
CYCLOHEXENE OXIDE	*N/A*	N/D	N/D	N/D	N/D	*NSA*
HEXADECANOIC ACID	*N/A*	N/D	N/D	N/D	N/D	*NSA*
TOLUENE	*N/A*	N/D	N/D	N/D	N/D	*NSA*
TOTAL UNKNOWN TICs	*N/A*	N/D	N/D	N/D	N/D	*NSA*
TCL Pesticides/PCBs						
DDD	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	*NSA*
DDE	*0.008*	LT 0.008	LT 0.008	LT 0.008	LT 0.008	*NSA*
DDT	*0.007*	LT 0.007	LT 0.007	LT 0.007	LT 0.007	*NSA*
PCB-1260	*1.08*	LT 0.08	LT 0.08	LT 0.08	LT 0.08	*NSA*
Other Inorganics						
NITRATE/NITRITE	*0.6*	0.653	LT 0.6	LT 0.6	LT 0.6	*9.9*

GT = Greater Than
LT = Less Than
NA = Not Available
ND = Not Detected
NSA = No Standard Available
NT = Not Tested
S = Results Based on Internal Standards
TICs = Compounds For Which No Standard is Available for Identification
U = Unconfirmed
[ ] = Detected concentration exceeds comparison criterion
Source: Final Remedial Investigation Report August 1992

- *Soil Investigation Results.* Analysis of the soil samples detected slightly elevated concentrations of several metals in most of the samples. The elevated concentrations are likely to be associated with the metal scrap found in the inactive disposal areas. Trace concentrations of pesticides were found in several soil samples. One PCB compound was detected at trace concentrations in one soil sample. The presence of these two compound classes are thought to be due to site-wide pesticide use or residual from empty pesticide containers. The detected concentrations of the metals, PCBs, and pesticides are below their respective cleanup criteria established for UMDA.

  The potential for migration of these compounds from the soil to the ground water is low due to the limited precipitation the area receives. This conclusion is further supported by the fact that these compounds were not detected in the ground water samples collected at the ILOU.

- *Ground Water Investigation Results.* Several metals were detected in the ground water at levels below the comparison criteria and are not considered to be of concern. Vanadium was at slightly elevated concentrations apparently due to naturally occurring conditions. Nitrate/nitrite and antimony were slightly elevated during initial sampling events but were not elevated consistently and are not considered to be of concern. Arsenic was detected at concentrations slightly above "background," but well below the comparison criteria. Upon further review and evaluation of the ground water data, it was determined that the arsenic background concentrations were actually slightly higher than previously thought; and that the arsenic concentrations detected in the ground water at the inactive landfills were representative of naturally occurring conditions. RDX was detected in one sample below drinking water standards at trace concentrations and is not considered to be of concern.

  The ground water results confirmed the results of the first phase ground water investigation and suggest that the ground water has not been affected by landfilling activities.

  Although it is not possible to completely determine the contents of a site as diverse as the inactive landfills, the sampling plan was developed based on the site's size and reported contents, and was biased to include the areas most likely to show contamination. The number of samples collected was considered to be sufficient to adequately characterize the site.

2.6 Summary of Site Risks

This section summarizes the human health risks and environmental effects associated with exposure to site contaminants and provides potential remedial action criteria.

2.6.1 Human Health Risks

A baseline risk assessment was conducted as part of the 1992 RI to determine the likely potential risk the site would pose to public health if no clean-up activities were performed. A risk assessment consists of several steps. The first step is an exposure

analysis where potential pathways by which someone might be exposed to a compound are identified. If there are no exposure pathways, there is no risk. Second, a list of compounds, ("contaminants of concern"), is developed. These are the compounds that will be considered in the risk calculations. They are chosen based on their concentration and potential toxicity. For this risk assessment, the contaminants were selected to be "contaminants of concern" if they were found to be above background or present at elevated concentrations. Compounds found to be elevated due to naturally occurring conditions, with the exception of nitrate/nitrite, were also included to produce a more conservative risk estimate.

Once the contaminants of concern are identified, a toxicity assessment is performed. Assumptions and data from toxicological studies on humans and animals are used to quantify the potential toxicity or potency of a particular compound. In addition, the calculations are performed to protect the most sensitive population and contain conservative assumptions on, for example, duration and magnitude of exposure. As such, there is uncertainty associated with risk assessments and they should be used as only an instrument for determining relative priorities for clean-up of contaminated sites, not a predictive tool.

All of this information is combined to perform the human health risk evaluation, where the potential risk to human health posed by the site is quantified. A hazard index is generated for potential noncarcinogenic effects, and a cancer risk level is generated for potential carcinogenic contaminants. In general, a hazard index of less than one indicates that even the most sensitive population is not likely to experience adverse health effects. The cancer risk level is expressed as a probability and indicates the additional chance that an individual will develop cancer over a lifetime of exposure. EPA's acceptable risk range for cancer is 1×10^{-4} to 1×10^{-6}; or one additional chance in ten thousand to one additional chance in one million that a person will contract cancer if they are exposed to a site for 30 years.

2.6.1.1 Exposure Analysis. The populations at risk of exposure to this site were identified by considering both current and future use scenarios. A detailed risk analysis of the current land use scenario was not evaluated for several reasons:

- Access to the ILOU is limited to UMDA personnel;
- The ILOU is not active so there is no population currently exposed to the sites; and
- Water supply wells do not presently exist at the ILOU, therefore there is no potential for exposure to ground water from the site.

In summary, risks associated with current land use were not evaluated because the potential for, and duration of exposure was expected to be small. In addition, an evaluation of risk associated with residential land use of this site will generate the most conservative risk estimate. If the risk assessment showed residential use of the site to be acceptable, it would indicate that all other potential scenarios, including the current land use, are also acceptable. Therefore, the population hypothetically exposed to the contaminants was site residents.

The potential risks associated with a future residential land use were analyzed in detail. The exposure routes that were evaluated include:

- Drinking ground water from beneath the ILOU;
- Showering with ground water from beneath the ILOU; and
- Eating crops grown at the site and irrigated with ground water from beneath the ILOU.

2.6.1.2 Contaminant Identification. The compounds evaluated in the risk assessment, and the concentrations of those chemicals are listed in Table 6. Although the remedial investigation determined that these compounds are not associated with the ILOU, and not of concern, they were carried through the risk assessment to generate a most conservative risk estimate.

Health effects criteria for the compounds of concern, including the Cancer Potency Factor and Reference Dose for those compounds, are listed in Table 7. Cancer Potency Factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. Cancer Potency Factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs which are expressed in units of (mg/kg-day) are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely.

Reference Doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

As indicated above, there is a significant level of uncertainty associated with risk assessments. However, the information that is used in a risk assessment is generally biased to ensure that a conservative, overestimation of risk will be generated, rather than an underestimation.

2.6.1.3 Risk Evaluation. Table 8 presents the risk factor and hazard index values associated with each exposure pathway. Tables 9 through 11 present the risk factors and hazard indices estimates broken down by compound for each exposure pathway. Results of the risk evaluation show that ground water ingestion poses the largest potential risk

TABLE 6

Occurrence and Distribution of Compounds Evaluated in the Inactive Landfills Risk Assessment

COMPOUND	UNITS	Frequency of Detection	Percent Positive Detections	Range of Sample Detection Limits	Range of Detected Concentrations	Upper 95 Percent Confidence Limit (a)	Location of Max. Conc.	Comparison Conc.	Criteria Type	Number of Exceedances
TAL Inorganics										
ANTIMONY	UGL	5 / 30	17	3 - 3.03	3.3 - 10.4	2.88	12-1	1	Bkgd	5
ARSENIC	UGL	25 / 30	83	5 - 5	4.16 - 7.36	5.23	12-1	1	Bkgd	25
COPPER	UGL	8 / 30	27	8.09 - 8.09	3.54 - 19.2	5.82	12-1	1	Bkgd	8
CYANIDE	UGL	1 / 30	3	2.5 - 16	18.5 - 18.5	4.16	010	–	NSA	NA
LEAD	UGL	10 / 30	33	1.26 - 2.5	1.41 - 6.37	2.06	MW-37	5	Bkgd	1
NICKEL	UGL	6 / 30	20	9.6 - 34.3	10.6 - 67.6	25.7	MW-40	–	NSA	NA
VANADIUM	UGL	24 / 24	100	DLNA	23.1 - 35.8	30.3	12-1	–	NSA	NA
ZINC	UGL	8 / 30	27	21.1 - 21.1	30.8 - 1400	379	MW-37	40	Bkgd	7
Explosives										
RDX	UGL	1 / 30	3	0.63 - 2.11	4.03 - 4.03	1.21	12-1	–	NSA	NA
TETRYL	UGL	1 / 30	3	0.556 - 0.66	1.24 - 1.24	0.373	MW-40	–	NSA	NA

(a) = Upper 95 percent confidence limit on the arithmetic mean. Calculated assuming one-half the detection level as the concentration for those samples in which a given analyte was not detected

Bkgd = The maximum detected concentration in background ground water

DLNA = Detection Level Not Available. The detection levels could not be ascertained because constituents were detected in all relevant samples

NA = Not Applicable

NSA = No Standard Available for Compound

TAL = Target Analyte List

TCL = Target Compound List

TIC = Tentitively Identified Compound

UGL = ug/L

Source: Final Human Health Baseline Risk Assessment, August, 1992

Table 7

Summary of Toxicity Criteria for the Contaminants of Concern at the Inactive Landfills

Chemicals	RfDo (mg/kg/day)	UF	Confidence	Critical Effect	RfDi (mg/kg/day)(aa)	UF	Confidence	Critical Effect
TAL Inorganics								
Antimony	4.0E-04	1000	Low	Longevity, blood glucose levels; serum cholesterol	ND	–	–	–
Arsenic	3.0E-04	3	Medium	Hyperpigmentation, keratosis vascular complications	UR	–	–	–
Copper	3.7E-02	1	Low	MCL	1.0E-02	–	Low	–
Lead	IUBK Model (see text)			Neurotoxicity in children	ID	–	–	–
Nickel	2.0E-02(f)	300	Medium	Decreased body, liver and spleen weights	UR	–	–	Neurotoxicity
Vanadium	7.0E-03	100	Low	NOAEL; highest level tested	ND	–	–	–
Zinc	2.0E-01(i)	100	–	Anemia	ND	–	–	–
Cyanide (free)	2.0E-02	100(j)	Medium	Weight loss, thyroid effects; demyelination	ND	–	–	–
Explosives								
RDX	3.0E-03	100	High	NOAEL; higher levels associated with prostate inflammation, tremors, hepatic and renal effects	ND	–	–	–
Tetryl	1.0E-02	10,000	Low	Blood coagulation defects; hepatic lesions and necrosis	ND	–	–	–

Source: Dames & Moore Final Human Health Baseline Risk Assessment, August 1992.

Table 7 (cont.)

Summary of Toxicity Criteria for the Contaminants of Concern at the Inactive Landfills

Chemicals	SFo 1/(mg/kg/day)	Types of Cancer	SFI 1/(mg/kg/day)	Types of Cancer	Weight-of-Evidence Class	Sources
TAL Inorganics						
Antimony	NC	-	ND	-	-	1,1,1,1
Arsenic	1.75E+00	Skin cancers	1.4E+01	Lung cancers	A	1,1,1,1
Copper	ND	-	ND	-	D	3,3,1,1
Lead	ID	Renal tumors	ID	Digestive tract; respiratory	B2	4,4,1,1
Nickel	ND	-	8.4E-01(g)	Lung and nasal tumors	A	1,1,1,1
Vanadium	ND	-	ND	-	-	2,1,1,1
Zinc	ND	-	ND	-	D	2,1,1,1
Cyanide(free)	ND	-	ND	-	D	1,1,1,1
Explosives						
RDX	1.1E-01	Hepatocellular carcinomas/adenomas	ND	-	C	1,1,1,1
Tetryl	ND	-	ND	-	-	6,-,-,-

Source: Dames & Moore Final Human Health Baseline Risk Assessment, August 1992.

Table 7 (cont.)

Summary of Toxicity Criteria for the Contaminants of Concern at the Inactive Landfills

Footnotes:

(aa) - Inhalation reference doses were calculated from reference air concentrations (RFCs) assuming that a standard 70kg human inhales 20 cubic meters of air/day (USEPA, 1989b). Limitations of these assumptions are discussed in the uncertainty section of the text.

(a) - Source codes are listed below. The 4 values shown in this column are the sources for the oral *Rfd*, the inhalation *RfD*, the oral slope factor, and the inhalation slope factor, respectively.

(1) USEPA, 1991d.
(2) USEPA, 1991e.
(3) USEPA, 1991g.
(4) USEPA, 1991k.
(5) Brower, 1992.
(6) USEPA, 1990.
(7) Ris. 1992.
(8) Ris. 1991.
(9) Poirier, 1992.

(c) - Values for hexavalent chromium are used in this risk assessment.

(f) - Listed value is for the soluble salts of nickel.

(g) - Listed values are for nickel refinery dust and nickel subsulfide, respectively. Most conservative value (e.g., nickel subsulfide) used in this Baseline RA.

(i) - Under RfD/RfC Work Group review.

(j) - A modifying factor of 5 was used to reflect tolerance to cyanide when administered in food.

(p) - The UF confidence level, and basis for the RfDo for aluminum are unknown. However, exposure to aluminum has been associated with neurological effects.

"--" - Not applicable.

Acronyms:

RfDo	Oral reference dose
UF	Uncertainty factor
RfDi	Inhalation reference dose
SFo	Oral slope factor
SFi	Inhalation slope factor
ND	No data
ID	Insufficient data available
UR	Under review
NOEL	No observable effect level
NOAEL	No observable adverse effect level (see Appendix B)
MCL	Maximum contaminant level
CNS	Central nervous system
RfC	Reference concentration (see Appendix B)
CRAVE	Carcinogen Risk Assessment Verification Endeavor (see Appendix B)

Source: Final Human Health Baseline Risk Assessment, August 1992.

TABLE 8

Multiple Pathway Potential Carcinogenic Risks and Noncarcinogenic Hazards at the Inactive Landfills Future Residential Land Use Scenario

Pathway Number	Pathway Description	Risk	Hazard Index
5	Ingestion of Ground Water	1E-04	9E-01
7	Dermal Absorption of Ground Water Contaminants During Showering	9E-10	7E-06
12	Consumption of Crops	2E-07	2E-03
Total		**1E-04**	**9E-01**

Source: Final Human Health Baseline Risk Assessment, August, 1992

TABLE 9

Potential Carcinogenic Risks and Noncarcinogenic Hazards Due to Ingestion of Ground Water from the Inactive Landfills Future Residential Land Use Scenario

Analyte	Carcinogenic Intake (mg/kg/day)	Slope Factor 1/(mg/kg/day)	Risk
Antimony	--	--	--
Arsenic	6.14E-05	1.75E+00	1E-04
Copper	--	--	--
Lead	--	--	--
Nickel	--	--	--
Vanadium	--	--	--
Zinc	--	--	--
Cyanide	--	--	--
RDX	1.42E-05	1.1E-01	2E-06
Tetryl	--	--	--
Total			**1E-04**

Analyte	Noncarcinogenic Intake (mg/kg/day)	Reference Dose (mg/kg/day)	Hazard Quotient
Antimony	7.89E-05	4.0E-04	2E-01
Arsenic	1.43E-04	3.0E-04	5E-01
Copper	1.59E-04	3.7E-02	4E-03
Lead	5.64E-05	**	**
Nickel	7.04E-04	2.0E-02	4E-02
Vanadium	8.30E-04	7.0E-03	1E-01
Zinc	1.04E-02	2.0E-01	5E-02
Cyanide	1.14E-04	2.0E-02	6E-03
RDX	3.32E-05	3.0E-03	1E-02
Tetryl	1.02E-05	1.0E-02	1E-03
Total			**9E-01**

"--" Not calculated because contaminant is not considered a carcinogen or potency factor is not available
"**" Reference dose not available
Source: Final Human Health Baseline Risk Assessment, August, 1992

TABLE 10

Potential Carcinogenic Risks and Noncarcinogenic Hazards Due to Dermal Absorption of Ground Water Contaminants at Inactive Landfills Future Residential Land Use Scenario

Analyte	Carcinogenic Intake (mg/kg/day)	Slope Factor 1/(mg/kg/day)	Risk
RDX	8.45E-09	1.1E-01	9E-10
Tetryl	--	--	--
Total			**9E-10**

Analyte	Noncarcinogenic Intake (mg/kg/day)	Reference Dose (mg/kg/day)	Hazard Quotient
RDX	1.97E-08	3.0E-03	7E-06
Tetryl	8.69E-09	1.0E-02	9E-06
Total			**7E-06**

"--" Not calculated because contaminant is not considered a carcinogen or potency factor is not available

Source: Final Human Health Baseline Risk Assessment, August, 1992

TABLE 11

Potential Carcinogenic Risks and Noncarcinogenic Hazards Due to the Consumption of Crops Grown at the Inactive Landfills Future Residential Land Use Scenario

Analyte	Carcinogenic Intake (mg/kg/day)	Slope Factor 1/(mg/kg/day)	Risk
Antimony	--	--	--
Arsenic	9.83E-09	1.75E+00	2E-08
Copper	--	--	--
Lead	--	--	--
Nickel	--	--	--
Vanadium	--	--	--
Zinc	--	--	--
Cyanide	--	--	--
RDX	2.05E-06	1.1E-01	2E-07
Tetryl	--	--	--
Total			**2E-07**

Analyte	Noncarcinogenic Intake (mg/kg/day)	Reference Dose (mg/kg/day)	Hazard Quotient
Antimony	xx	4.0E-04	xx
Arsenic	2.29E-08	3.0E-04	8E-05
Copper	xx	3.7E-02	xx
Lead	1.13E-08	**	**
Nickel	1.41E-06	2.0E-02	7E-05
Vanadium	xx	7.0E-03	xx
Zinc	xx	2.0E-01	xx
Cyanide	xx	2.0E-02	xx
RDX	4.77E-06	3.0E-03	2E-03
Tetryl	1.35E-06	1.0E-02	1E-04
Total			**2E-03**

"--" Not calculated because contaminant is not considered a carcinogen or potency factor is not available
"xx" Quantitative information on uptake factors not available
"**" Reference dose not available
Source: Final Human Health Baseline Risk Assessment, August, 1992

at this site. Arsenic, a naturally occurring element, is primarily responsible for the risk. However, even with the inclusion of arsenic in the evaluation, the cancer risk is within the acceptable risk range (10^{-4} to 10^{-6}) established by the NCP. The non-carcinogenic risk is also below the acceptable risk threshold of 1. Removing arsenic from the calculation reduces the hazard index further, bringing it to well below a level of concern.

2.6.1.4 Human Health Risk Characterization Summary. Compounds determined to be present at background concentrations as well as compounds attributed to the landfills were included in the risk assessment. Future residential land use was the scenario evaluated. This evaluation estimated the potential risk associated with: drinking and showering with water from a well installed beneath the landfills; and eating crops grown at the site over a long period of time, for persons residing on-site. These assumptions were made to generate a very conservative, worst case, risk estimate. The risk assessment determined that the landfills do not pose an unacceptable risk to human health. Although the noncarcinogenic risk estimate for the ILOU was slightly above one, the elevation in risk was due primarily to the presence of arsenic. This compound is not associated with the landfills; its concentration is consistent with background ground water quality. When arsenic is removed from the risk calculation, the hazard index falls to a value below a level of concern.

An uncertainty associated with the risk assessment is whether the worst contaminated areas were actually located by the sampling performed. Though a representative number of samples were collected, with the worst sites being targeted during the sampling, some portions of the inactive landfills were not sampled. However, the likelihood that higher concentrations were missed is not considered significant and is also mitigated by the use of the reasonable maximum exposure (RME) concentration in the risk calculations.

Though the inactive landfill areas are not expected to change in usage, predicting future use also has some uncertainty associated with it. The risk assessment assumptions of limited or no exposure to contaminated subsurface soils could be incorrect at some time in the future, though this is not expected to have a significant effect. Even with residential use the estimated remediation goals for soil were not exceeded by the RME concentrations at an excess cancer risk level of 1 times 10^{-5} and hazard index of 1 (see Table 12). Therefore, the uncertainty of future land use does not affect the remediation decision at this site.

2.6.2 Environmental Risks

An ecological risk assessment was performed for UMDA to determine the potential for the site to negatively affect site animal or vegetative populations. This assessment did not specifically address the ILOU, but focused on the potential effects associated with the most seriously contaminated sites at UMDA. It was assumed that this would provide a most conservative estimate of potential negative ecological effects.

Preliminary results of the assessment indicate that the most contaminated sites at UMDA are causing only limited negative impact on the local ecological environment. The potential for negative ecological impact associated with the ILOU is considered minor. The most significant potential risk to local wildlife associated with the site results from ground water ingestion, and there is no potential ecological exposure route to ground water.

Table 12: Comparison of 95% Upper Confidence Limit Concentrations and Remedial Goals for the Soils of the Umatilla Depot Activity Inactive Landfills Operable Unit

Analyte	95% Upper Confidence Limit (ppm)	Remedial Goal (ppm) (Residential Land Use)
Arsenic	2.49	3.63
Barium	133	13,700
Beryllium	1.12	1.48
Chromium	8.45	190
Copper	78.1	10,100
Iron	29,863	*
Lead	20	200**
Mercury	0.058	81.9
Nickel	12.5	4,700
Silver	0.344	1,370
Vanadium	95.9	1,920
Zinc	175	54,800
DDD	0.01	26.6
DDE	0.006	18.8
DDT	0.008	18.8
PCB 1260	0.055	0.830
Nitrate/Nitrite	20	43,800

*Relevant health effects information not available.
**Based on lead uptake biokinetic model.

Note: Values above obtained from: *Human Health Baseline Risk Assessment, Umatilla Depot Activity*, Hermiston, Oregon, U.S. Army Toxic and Hazardous Materials Agency (now Army Environmental Center), Aberdeen Proving Ground, Maryland, August 1992.

2.7 Description of the "No-Action" Alternative

The Army, EPA and ODEQ have agreed that results of the environmental investigations and the human health risk assessment performed at ILOU demonstrate that the site does not pose a significant risk to human health and the environment; and that no further action is required. In choosing the no further action alternative, EPA reserves its authority to perform additional response actions should new information necessitate such a decision.

2.8 Documentation of Significant Changes

The preferred alternative presented in the Proposed Plan for the Inactive Landfills Operable Unit was the final remedy selected; no significant changes have been made.

Section 3

Responsiveness Summary

The final component of the ROD is the Responsiveness Summary, which serves two purposes. First, it provides the agency decision makers with information about community preferences regarding the remedial alternatives and general concerns about the site. Second, it demonstrates to members of the public how their comments were taken into account as a part of the decision-making process.

Historically, community interest in the UMDA installation has centered on the impacts of installation operations on the local economy. Interest in the environmental impacts of UMDA activities has typically been low. Only the proposed chemical demilitarization program, which is separate from CERCLA remediation programs, has drawn substantial comment and concern.

As part of the installation's community relations program, the UMDA command assembled in 1988 a TRC composed of elected and appointed officials and other interested citizens from the surrounding communities. Quarterly meetings provide an opportunity for UMDA to brief the TRC on installation environmental restoration projects and to solicit input from the TRC. The TRC was briefed, on August 12, 1992, on the scope and results of the supplemental investigation of and the preferred alternative for, the Inactive Landfills Operable Unit as presented in the proposed plan. The response received from the TRC was positive.

Notice of the public comment period, public meeting, and availability of the Proposed Plan was published in the *Hermiston Herald*, the *Tri-City Herald*, and the *East Oregonian* in September 1992.

The Proposed Plan for the Inactive Landfills Operable Unit was released to the public on August 31, 1992. The public comment period started on that date and ended on September 30, 1992. The documents constituting the administrative record were made available to the public at the following locations: UMDA Building 1, Hermiston, Oregon; the Hermiston Public Library, Hermiston, Oregon; and the EPA Office in Portland, Oregon.

A public meeting was held at Armand Larive Junior High School, Hermiston, Oregon, on September 15, 1992, to inform the public of the preferred alternative and to seek public comments. At this meeting, representatives from UMDA, USATHAMA, EPA, ODEQ, and Arthur D. Little, Inc. presented the proposed remedy. Approximately ten persons from the public and media attended the meeting.

No comments or questions regarding the proposed alternative, either verbal or written, were received by UMDA, EPA, or ODEQ during the public meeting or during the comment period.

Appendix 1

State of Oregon's Letter of Concurrence

Oregc

DEPARTMENT
ENVIRONMENT
QUALITY

OCTOBER 20, 1992

Ms. Dana Rassmussen
Regional Administrator
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Re: Umatilla Depot Activity
Inactive Landfills Operable Unit
Record of Decision

Dear Ms. Rassmussen:

The Oregon Department of Environmental Quality (DEQ) has reviewed the draft Record of Decision, for the Inactive Landfills Operable Unit at the U.S. Army's Umatilla Depot Activity. I am pleased to advise you that DEQ concurs with the no-action remedy recommended by EPA and the Army. I find that this alternative is protective, and to the maximum extent practicable is cost effective, uses permanent solutions and alternative technologies, is effective and implementable. Accordingly, it satisfies the requirements of ORS 465.315, and OAR 340-122-040 and 090.

Notwithstanding this no-action remedy, it is understood that the Army has agreed to resample the Western Inactive Drum Site and that any drums found to contain hazardous substances will be removed and properly disposed.

If you have any questions concerning this matter, please contact Mr. William Dana of the Department's Environmental Cleanup Division, at (503) 229-6530.

Sincerely,

Fred Hansen
Director

WD:m
SITE\SM35\SM4709
cc: Lewis D. Walker, DOD
LTC. William McCune, UMDA
Harry Craig, EPA-OOO
Bill Dana, SRS, DEQ

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